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Abstract

Because financial and macroeconomic conditions are tightly interconnected, financial stability considerations are an important element of any monetary policy framework. Yet, the circumstances under which it would be appropriate for the Bank to use monetary policy to lean against financial risks need to be more fully specified (Côté 2014). The extent to which financial stability concerns should be taken into account by monetary policy will be a priority topic of research at the Bank for the renewal of the inflation-control target agreement in 2016. This paper reviews four considerations of interest, taking stock of key domestic and international developments and knowledge gained over the past few years: (i) Canada and other countries have made significant progress in the implementation of micro- and macroprudential regulatory reforms, and limited existing research finds that most of these policies were effective in reducing the potential need for leaning by monetary policy; (ii) the effectiveness of the monetary policy transmission mechanism depends on the state of the financial system, implying that financial system conditions need to be taken into account by monetary policy; (iii) although exceptionally low interest rates and other forms of monetary stimulus are sometimes needed to support growth and achieve inflation-target mandates, they may lead to excessive risk-taking activities and therefore contribute to the buildup of financial imbalances; and (iv) coordination of monetary and macroprudential policies for dealing with imbalances may, in some circumstances, be beneficial. The paper concludes by identifying future areas of research to further clarify the role of monetary policy in addressing financial stability risks.

JEL classification: E0, E44, E52, E58, G18
Bank classification: Financial stability; Monetary policy framework

Résumé

Parce que les conditions financières et les conditions macroéconomiques sont étroitement liées, les considérations entourant la stabilité financière occupent une place importante dans tout cadre de politique monétaire. Pour autant, il faut préciser davantage dans quelles circonstances il serait approprié pour la Banque de recourir à la politique monétaire afin de contrer les risques financiers (Côté, 2014). Déterminer à quel point il convient d'intégrer dans la politique monétaire des considérations relatives à la stabilité financière sera un sujet de recherche prioritaire en vue du renouvellement de l'entente portant sur la cible de maîtrise de l'inflation en 2016. Cette étude revient sur quatre considérations, en se fondant sur les changements majeurs intervenus au Canada et ailleurs au cours des dernières années et sur les connaissances acquises

depuis : a) le Canada et d'autres pays ont accompli des progrès sensibles dans la mise en place des réformes de la réglementation microprudentielle et macroprudentielle; le petit nombre de travaux existants ont révélé que la plupart des politiques suivies ont pu permettre de limiter l'utilisation potentielle de la politique monétaire comme instrument de prévention des risques financiers; b) puisque l'efficacité du mécanisme de transmission de la politique monétaire dépend de l'état du système financier, il faut que la politique monétaire prenne en compte les conditions présentes au sein du système financier; c) même s'ils sont parfois incontournables pour stimuler la croissance et permettre d'atteindre la cible d'inflation, des taux d'intérêt particulièrement bas et d'autres formes de détente monétaire peuvent conduire à une prise de risque excessive et, dès lors, à la création de déséquilibres financiers; d) coordonner la politique monétaire et la politique macroprudentielle afin de s'attaquer à ces déséquilibres donne des résultats probants dans certains cas. L'étude délimite en conclusion des axes de recherche qui devraient permettre de mieux définir le rôle que peut remplir la politique monétaire face aux risques touchant la stabilité financière.

Classification JEL : E0, E44, E52, E58, G18
Classification de la Banque : Stabilité financière; Cadre de la politique monétaire

1. Introduction

Financial stability is a precondition for a healthy economy. Given this, along with the understanding that financial and macroeconomic conditions are tightly interconnected, financial stability considerations are an important element of any monetary policy framework. The global financial crisis has only reinforced this reality. As a result, the extent to which financial stability concerns should be taken into account by monetary policy became a priority topic of the research program at the Bank for the renewal of the inflation-control target agreement in 2011. The main conclusion at the time was that while the Bank should continue to closely monitor financial conditions, other tools should be used as the first line of defence against financial stability concerns (such as macroprudential regulation), with monetary policy standing as the last line of defence.[1]

There was also the understanding that more work was needed to refine the Bank's framework for assessing the costs and benefits of possible monetary policy intervention to address financial stability concerns, and this continues to be a priority topic in the lead-up to the 2016 renewal. While low, stable and predictable inflation is a necessary condition for financial stability, it is by no means sufficient (Poloz 2015). And to the extent that financial stability affects price stability, the conditions under which monetary intervention is beneficial need to be better understood.[2]

It is important, therefore, to recognize that under certain economic circumstances, such as in an environment of sustained low interest rates and elevated household imbalances, financial stability and monetary policy can become closely intertwined.[3] On the one hand, financial system conditions can have an impact on the effectiveness of monetary policy; and monetary policy can contribute to the buildup of financial imbalances and thus influence the probability and severity of future crises. On the other hand, to the extent that the first lines of defence against financial imbalances are effective, the need for monetary policy intervention to address financial stability concerns is reduced or eliminated.

This paper is organized as follows. Section 2 briefly reviews the most important developments in micro- and macroprudential regulatory policies and discusses our current understanding of their effectiveness in preventing financial imbalances. Section 3 details how the evolution of financial system conditions may affect the monetary policy transmission mechanism. Section 4 reviews the channels through which monetary policy could contribute to the buildup of financial imbalances—in particular, the risk-taking channel. Section 5 discusses issues related to the coordination of monetary and macroprudential policies. Section 6 identifies future areas of research to clarify the role of monetary policy in addressing financial stability risks, including implementation issues.

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[1] See Bank of Canada (2011).

[2] Recent surveys on this topic are Smets (2014), Hellwig (2014), Reichlin and Baldwin (2013), Melino (2012), Svensson (2014), and Williams (2014).

[3] Current monetary conditions continue to create incentives for increased risk taking in financial markets, both globally and in Canada.

2. Effectiveness of Micro- and Macroprudential Tools in Mitigating Financial Imbalances

Since 2008, the global financial regulatory and supervisory framework has undergone sweeping reform. Measures prescribed by the reform effort can be broadly divided into structural and cyclical. Structural measures are intended to enhance the overall resilience of the financial system to the buildup of imbalances or to withstanding adverse shocks. Cyclical measures, on the other hand, prescribe time-varying implementation of regulatory tools and policies under circumstances when shocks or imbalances are perceived to be imminent.

The broad implications for monetary policy are twofold. To the extent that structural regulatory reform reduces financial risks facing the economy, it removes some of the potential need for policy intervention. And at times when such need does arise, cyclical regulatory policies may provide some countercyclical stabilization, reducing the case for monetary policy leaning. Below, we provide a brief summary of the reforms and their effectiveness in addressing financial imbalances.[4]

Structural measures

In regard to structural measures, key elements of the reform agenda included enhanced transparency and disclosure; higher capital, liquidity and leverage standards; enhanced regulation and more intense supervision of all systemically important financial institutions; credible and effective resolution regimes for large financial institutions; stronger infrastructure for key financial markets; and increased adherence to international prudential regulatory and supervisory standards. Significant progress has been made in implementing these reforms both in Canada and internationally.

The new global standards in the Basel III Capital Accord have strengthened the bank capital regime by substantially increasing the loss-bearing capital that financial institutions must hold and by establishing new liquidity standards and a limit on leverage as a complement to the risk-weighted measures. Currently, implementation of these capital and liquidity regulations in Canada is proceeding well in advance of the Basel III timelines (for more details see Appendix A). Canada has also made significant progress in the implementation of standards for compensation practices by financial institutions and the implementation of recovery and resolution plans for domestic systemically important banks (D-SIBs).[5] Furthermore, some progress has been made in the implementation of over-the-counter (OTC) derivatives reforms.[6]

The stimulative monetary conditions that have supported economic activity in Canada since the onset of the financial crisis have had an important effect on the housing sector. To limit the

[4] More information on these issues can be found in Appendices A and B.

[5] As noted by the IMF (2014), Canada had established recovery and resolution plans for D-SIBs as early as 2010, well before the formal regime was announced.

[6] In the area of trade reporting for OTC derivatives, requirements came into effect on 31 October 2014 in some provinces. In addition, the Office of the Superintendent of Financial Institutions has clarified its expectations with respect to the derivatives activities of federally regulated financial institutions.

potential buildup of excesses in the housing market and promote its long-term stability, Canadian authorities have introduced a number of macroprudential policy measures. These measures include a reduction in the maximum amortization period for high loan-to-value (LTV) loans to 25 years; the establishment of a 5 per cent minimum down payment for owner-occupied properties; the introduction of a maximum total debt-service ratio of 44 per cent; a tightening of LTV ratios on refinancing loans and on loans for purchasing properties not occupied by the owner; and withdrawal of government insurance backing on lines of credit secured by homes, including non-amortizing home equity lines of credit.

Macroprudential policy measures have also been accompanied by new prudential rules: the Office of the Superintendent of Financial Institutions (OSFI) issued a guideline to strengthen mortgage underwriting standards; the oversight of the Canada Mortgage and Housing Corporation (CMHC) was enhanced; the government restricted new guarantees under the National Housing Act Mortgage-Backed Securities program; and CMHC reduced access to its portfolio insurance product.

Cyclical measures

While regulatory and supervisory measures traditionally increase the resilience of the financial system and lead to greater financial stability in the long run, their countercyclical application over the cycle—tightening more at the time of the buildup of imbalances—affects the short-run outlook (see, for example, Stein 2013; Kohn 2013; and Bean 2014).

To protect the banking sector from periods of excess aggregate credit growth that have often been associated with a buildup of system-wide risk, a new macroprudential tool, the countercyclical capital buffer (CCyB), has been included in Basel III (Chen and Christensen 2010). Operationalization of the CCyB is currently under way and will be phased in beginning 1 January 2016, becoming fully effective on 1 January 2019.[7] Yet, the CCyB and other countercyclical policies are still primarily seen as creating buffers to absorb shocks and increase banking system resilience, rather than leaning against the financial and credit cycles and their macroeconomic consequences.[8] Hence, it has yet to be determined whether this relatively novel feature of macroprudential policy can substantially alleviate the burden of cyclical financial imbalances.

Impact and effectiveness of recent regulatory policies

While there is already a substantial body of theoretical literature suggesting that regulatory policies can indeed be effective, corroboration will inevitably depend on the available empirical evidence. Since there are only a few years of post-crisis data, the empirical evidence is very limited. Most of it applies to structural micro- and macroprudential policies, and less so to the effectiveness of countercyclical policies.

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[7] So far, jurisdictions that have activated the CCyB include Norway, Sweden, the United Kingdom, Hong Kong and Switzerland.

[8] Some of the challenges of using the CCyB are related to the difficulties of measuring/identifying the financial cycle and the determination of the right timing for activating/deactivating the tool.

For instance, on the structural side, under the auspices of the Financial Stability Board and the Basel Committee on Banking Supervision, two groups—the Long-Term Economic Impact Group (LTEIG) and the Macroeconomic Assessment Group (MAG)—were tasked with assessing the economic impact of Basel III minimum capital requirements (BIS 2010a, b). The LTEIG estimated the steady-state net benefits to be positive, and the MAG found the transition cost to be small. The Bank of Canada (2010) conducted its own assessment of the impact of such regulation in Canada and found similar results. Looking at the impact of structural macroprudential policies on the long-term stability of the housing and mortgage markets since 2009, Krznar and Morsink (2014) suggest that at least some of the slowdown in mortgage credit growth in Canada could be attributed to such policies. Recent research has also developed several conceptual frameworks for the analysis of macroprudential policies; analyses using these frameworks commonly point to a varying degree of net benefits stemming from structural and cyclical regulatory policies.[9]

It is unlikely, however, that the risks associated with elevated levels of financial vulnerability can be entirely offset by macroprudential policies, thus creating a potential need for monetary policy intervention. For example, regulatory tools may not perfectly control the buildup of imbalances (Stein 2014), or they may lead to residual systemic risk (Kocherlakota 2014). On the other hand, countercyclical application of regulatory policies, such as the CCyB, may reduce the need for leaning by monetary policy, at least in some circumstances. The experience of Switzerland in using the CCyB to address imbalances in the housing sector suggests that it might have been effective.[10] However, the experience of Norway suggests that, while the CCyB can be useful for signalling systemic risk from cyclical imbalances and the need for increased resilience, it is not an effective instrument for fine-tuning the economy or the financial cycle. More concrete implications for the conduct of monetary policy remain largely to be determined.

3. Financial System Conditions and the Monetary Transmission Mechanism

To understand the implications for monetary policy of the recent buildup of financial imbalances, one needs to form an understanding of how they have affected the transmission of monetary policy to the real economy and financial markets.[11]

Developments in financial system conditions may lead to changes in the degree of pass-through of monetary policy to the economy. Alpanda and Zubairy (2014) show that the effectiveness of

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[9] At the Bank, Christensen, Meh and Moran (2011) and de Resende et al. (2013) find that countercyclical bank leverage and countercyclical bank capital regulations have significant stabilizing effects on key macroeconomic variables after financial shocks. Alpanda, Cateau and Meh (2014) show that targeted regulatory tools, such as loan-to-value ratios, are the most effective in reducing household indebtedness (and monetary policy is the least effective).

[10] Basten and Koch (2014) use data on mortgage loan offers and analyze Switzerland's experience with the Basel III CCyB in 2013. When the CCyB was turned on in February 2013, banks were required to hold additional capital matching 1 per cent of risk-weighted mortgage loans by September 2013. They found that capital-constrained banks and those that specialize in mortgage loans increased offered mortgage rates in line with the objective of the CCyB.

[11] Appendix B discusses development of models incorporating the key links between real and financial sectors and monetary policy.

monetary policy intervention may depend on the composition of household debt. Moreover, under certain financial system conditions—such as elevated household imbalances—monetary policy leaning may lead to unexpected consequences. For example, the conventional wisdom that higher interest rates would reduce financial imbalances may be incorrect. As pointed out by Svensson (2014), the effect of monetary tightening on household indebtedness may not be commensurate with the tightening, depending on the level of debt and responses of households' new debt, debt service and income. Indeed, Alpanda and Zubairy (2014) show that when long-term (mortgage) debt is relatively high, monetary tightening may *increase* the debt-to-income ratio, even if it reduces the stock of real mortgage debt.

The effectiveness of monetary policy leaning, therefore, often depends on financial system conditions at the time of the policy change, and on their reaction to this change relative to the responses of macroeconomic variables. For example, the response of house prices affects the value of collateral and hence the amount of household borrowing; the resulting debt-to-income ratio affects the sensitivity of the consumption response (Bruneau et al. 2015).

Experience from other countries provides additional evidence for the dependence of monetary transmission on financial system conditions. Dudley (2014) argues that monetary tightening in the United States in 2004–07 should have been more aggressive, since financial market conditions and regulations remained loose and did not prevent the overheating of the housing sector. Dudley goes on to say that the dramatic tightening of financial market conditions, in the wake of the financial crisis in 2008, proved the degree of monetary accommodation to be insufficient, and the economy went into a sharp contraction

In all, variation in the pass-through of monetary policy to the economy resulting from developments in financial system conditions raises the question of whether monetary policy leaning should be conditioned to the circumstances under which its potential net benefits are higher.

4. Risk-Taking Channel of Monetary Policy

While financial system conditions can affect the transmission of monetary policy, the opposite effect—the impact of monetary policy on financial stability via the risk-taking channel, particularly in sustained low interest environments—should also be considered.[12]

Excessive risk-taking by financial institutions may arise when low interest rates create incentives for overinvestment in risky assets with higher returns in order to meet performance targets or to reduce the cost of risky real investment projects (Adrian and Liang 2014; Jiménez et al. 2014). Farhi and Tirole (2012) show that anticipation of policy interventions—such as the central bank's policy rate cut—that are supportive of financial institutions during times of financial crisis may create incentives for excessive risk taking. Furthermore, prolonged low interest rates, together with rising

[12] See Rajan (2006); Borio and Zhu (2012); and Adrian and Shin (2010). More recent studies include Cociuba, Shukayev and Ueberfeldt (2011); Jimenez et al. (2012); and de Groot (2014).

asset prices and sustained macroeconomic stability, can lead households to become complacent in their decision to increase leverage, creating the risk of a future sharp correction down the road (Carney 2011; Bauer 2014).

Empirical work by Bank staff provides evidence of the risk-taking channel operating through the behaviour of banks and fixed-income mutual funds (Paligorova and Sierra 2012; Paligorova and Santos 2012; Gungor and Sierra 2014).[13] Damar, Meh and Terajima (2015) report empirical evidence suggesting that, in an extended low interest rate environment, banks take on liquidity risk by supplying long-term assets funded by short-term market-based funding.[14]

The costs of risk-taking behaviour induced by accommodative monetary policy cannot be considered in isolation from the benefits of accommodative policy. Easing of monetary policy may be needed to foster macroeconomic stability prior to and during times of financial crises, and may even have direct positive effects on financial stability. For example, higher profit margins and lower delinquency and default rates may decrease risk aversion or raise prices of legacy assets or collateral assets, leading to healthier balance sheets (Chodorow-Reich 2014). Furthermore, premature removal of monetary stimulus, in order to alleviate risk-taking behaviour, could fall short of having a significant impact on financial imbalances (Bean et al. 2010), hinder the recovery that it helped generate (Tarullo 2014), or, under low capital or liquidity levels, even lead to a credit crunch (Jiménez et al. 2012).

5. Interaction between Macroprudential and Monetary Policies

Discussion of the relationship between monetary policy and financial stability often focuses on whether the monetary authority should act independently to offset any foreseeable financial imbalances before they become an issue, react to fill any gaps left open by macroprudential regulation, or follow the "separation principle" and leave financial stability to regulation alone (Bean 2003).

In this discussion, there is growing recognition that monetary policy cannot completely ignore financial stability issues, and that macroprudential regulation aimed at correcting imbalances can affect the conduct of monetary policy. Moreover, the conduct of monetary policy can affect the implementation of the regulatory reform (Claessens et al. 2013). For example, as pointed out in Côté (2014), tighter regulation may require, all else equal, a more stimulative monetary policy and vice versa. Therefore, while the optimal mix of policies may depend on many factors—such as the nature and severity of potential financial risks, the efficacy of each policy tool, and the expected

[13] Chodorow-Reich (2014) finds evidence that unconventional monetary policy and low interest rates in the United States led to modest risk taking by money market funds and defined-benefit pension funds, which dissipated by the end of 2013.

[14] Bank research finds that low-for-long interest rates may not only reflect a countercyclical monetary policy stance, but also be related to a lower neutral policy rate driven by structural forces, such as a lower global neutral rate and reduced potential output growth in Canada (Mendes 2014). Low long-term rates may also be a product of time-series variation in countercyclical risk premiums that may reduce the effectiveness of changes to the short-term policy rate (Bauer and Diez de los Rios 2012).

side effects of each tool on the economy—regulators and central bankers must also take into account the interplay between monetary policy and regulation.[15]

Recent research at the Bank clarifies some of the circumstances under which coordination between monetary and regulatory policies may be beneficial. Christensen, Meh and Moran (2011) study the relative effectiveness of countercyclical LTV ratios and monetary policy in reducing the amplitude and incidence of housing boom-bust cycles.

A growing literature provides examples of the circumstances under which monetary policy leaning may be beneficial, even when taking into account macroprudential regulation. For example, Angeloni and Faia (2013) study a business cycle model with procyclical bank leverage and risk, and find that countercyclical capital buffers in combination with monetary policy leaning—against rising asset prices or bank leverage—represent an optimal policy mix.

Building on this work will be important for understanding how the implementation of regulatory policies affects the conditions under which monetary policy should be concerned about financial stability, and for gauging the optimal extent of coordination between regulatory and monetary policies. Recent research suggests that it is not beneficial to pursue financial stability and macroeconomic stability separately, and that the effects of monetary and macroprudential policies should not be studied independently.

6. Conclusions: Clarifying Monetary Policy Leaning

As this paper has made clear, further research is required to specify more fully the circumstances under which it would be appropriate for the Bank to use monetary policy for financial stability purposes. Any considerations of monetary policy leaning will have to take into account both current and future states of macroprudential regulation, relevant initial conditions, and the interplay between monetary policy and regulation. A number of outstanding issues remain regarding the role of monetary policy vis-a-vis financial stability:

- To what extent are financial stability concerns adequately addressed by macroprudential regulation?
- What are the merits and potential implementation challenges of monetary policy leaning for financial stability issues?
- What is the impact of monetary policy on the probability and severity of future financial crises?

[15] Most of the literature assumes that policy institutions fully internalize *all* policy actions, not only their own. However, when the central bank adopts additional policy mandates, other policy-makers may no longer internalize the cost of missing their own policy objectives, leaving it to the central bank to ensure that those objectives are met, exacerbating the central bank's policy trade-off (Davig and Gürkaynak 2014).

- Can the interaction of monetary policy and macroprudential regulation be more fully accounted for?

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Appendix

A. The Reform of the Financial Regulatory and Supervisory Framework

The new global standards in the Basel III Capital Accord have strengthened the bank capital regime by substantially increasing the loss-bearing capital that financial institutions must hold and establishing new liquidity standards and a limit on leverage. The minimum capital requirement is being raised; there is greater emphasis on common equity capital (CET 1); the capital requirements for riskier activities are being increased (risk-weight calculations are becoming more stringent); and the definition of capital is being strengthened. In addition, for systemically important financial institutions, both globally and domestically, additional loss-absorbing capacity is being required (both through capital surcharges and the Financial Stability Board's Total Loss Absorbing Capacity requirements).

As a complement to the risk-based capital framework, a minimum leverage ratio is being imposed. In addition, to promote the short-term resilience of the liquidity risk profile of banks, a Liquidity Coverage Ratio (LCR) is being imposed to ensure an adequate stock of unencumbered high-quality liquid assets that can be converted easily and immediately into cash, in order to meet liquidity needs for 30 days. To supplement the LCR, the Net Stable Funding Ratio (NSFR) has been developed to promote resilience over a longer time horizon, by creating additional guidance for banks to fund their activities with more stable sources of funding on an ongoing basis.

Table 1 summarizes these capital and liquidity regulations and the timeline for their implementation. In all, implementation in Canada is well under way in advance of the Basel III timelines. Although, currently, none of the Canadian banks is designated a global systemically important bank (G-SIB), OSFI is imposing a capital surcharge of 1 per cent and proposing a High Loss Absorbing (HLA) capacity of 17 to 23 per cent for all Canadian domestic systemically important banks (D-SIBs).

To assess the potential unintended consequences the interactions of these regulations could have for the economy, the Bank must develop models that capture the frictions, externalities and systemic risk channels that the regulations are meant to address, as well as the endogenous response of financial institutions and equilibrium prices.

Table 1 - Increase in Scope and Depth of Capital and Liquidity Regulations

		Standard	Implementation Timeline	
			Canada	Global
Capital	CET 1 Minimum	4.5%	2013	2013-15
	Conservation Buffer	2.5%	2013	2016-19
	G-SIBs Surcharge	1-3.5%	NA	2016-19
	D-SIBs Surcharge in Canada	1%	2016	
	Countercyclical Buffer	0-2.5%	2016-19	2016-19
	Tier 1 Minimum (CET 1 + NVCC preferred shares)	6%	2014	2013-15
	Total Capital Minimum (Tier 1 + Tier 2 NVCC subordinated debt)	8%	In place	In place
	G-SIBs Total Loss Absorbing Capacity (TLAC) (Total Capital Minimum + Gone Concern Loss Absorbing Capacity)	16-20%	NA	After January 2019
	D-SIBs High Loss Absorbing (HLA) in Canada (TLAC + Conservation buffer and D-SIBs surcharge)	17-23%	To be announced	
	Leverage Ratio Minimum	3%	2015	2015-18
Liquidity	Liquidity Coverage Ratio (LCR)	30 days	2015	2015-19
	Net Stable Funding Ratio (NSFR)	Limit maturity mismatch	2018	2018

Note: NVCC means non-viability contingent capital.

B. Incorporating Real-Financial Linkages into the Bank's Policy Models

Staff developed new policy models that combine the standard open-economy framework with the key features of financial markets. This includes the macroprudential and monetary policy model (MP2) that incorporates balance sheets of households, firms, and banks, the risk-taking channel of monetary policy, and long-term debt and macroprudential tools (Alpanda, Cateau and Meh 2014). Bank staff also incorporated an international interbank market into a version of the BoC-GEM-Fin model. These models will facilitate a more detailed analysis of the circumstances under which it may be beneficial for monetary policy to lean against financial imbalances, such as whether leaning is more beneficial during times of heightened stress on households' balance sheets, or whether countercyclical capital buffers affect the timing of leaning.

A key ingredient of the Bank's analytical framework is the identification and analysis of financial risks and vulnerabilities. At the Bank, several models were integrated within the framework for risk identification and assessment (FRIDA). FRIDA links a collection of models that include early warning models (Li and St-Amant 2010), a household simulation model and the bank-network model (Anand et al. 2015) for banking sector stress simulations. FRIDA captures the impact of risks on three components of the financial system: households, the non-financial corporate sector and

domestic systemically important banks. At this time, however, the risk-assessment component in FRIDA quantifies the impact of risks but does not assess their probability.[16]

Modelling large and asymmetric financial risks is challenging, since it often requires a very different approach than the one used to model small and symmetric macroeconomic risks (Haldane 2012; Leahy 2014). Moreover, a large portion of financial risk can be endogenous to the financial system, implying that even relatively small disturbances originating in the financial system may lead to large and asymmetric macroeconomic outcomes (Brunnermeier and Sannikov 2014). Future work will continue to incorporate financial risks into the Bank's medium- and large-scale policy models.

[16] Recent studies using long multi-country data sets by Barro and Ursúa (2010), Jordà, Schularick and Taylor (2011), and Schularick and Taylor (2012) argue that financial crises recessions are not as rare as the post-war pre-crisis data suggest.